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MONITORING AND STABILIZING OF THE GLASS MELT REDOX POTENTIAL IN THE VERTICAL GLASS DRAWING SYSTEM

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The experience of the Irbitskii Glass Works showed that stable preservation of the FeO : Fe_2O_3 ratio at a prescribed level has a positive effect on the technical and economic parameters of sheet glass production.

The effect of the redox potential (ROP) of the batch (and glass melt) on the glass melting and molding conditions is generally known. Therefore, its level has to be monitored and stabilized.

The redox potential of a glass melt with a constant preset composition of the basic and acid oxides can vary in the course of melting for various reasons [1].

The laboratory studies performed at the Irbitskii Glass Works indicated that there is no exact correlation between the FeO content and the ROP of the batch (and the glass melt) [2], and yet a direct dependence of the FeO : Fe_2O_3 ratio (let us name it "the redox factor") on the batch ROP and the gas composition of the glass-melting furnace atmosphere was established.

The redox factor is the indicator of the state of equilibrium in the FeO $\leftrightarrows$ Fe_2O_3 system and the glass melt ROP. The stabilization of the redox factor at the optimum level ensures a successful control of glass melting and molding with good technical and economic parameters, the constancy of the glass thermal history, and the optimum diathermancy of the melt for a wide range of FeO and $Fe_2O_{3(tot)}$ in the melt (Table 1).

It is essential in the glass melting process to have a tool for monitoring and stabilizing of the redox factor. The practical parameters of the vertical glass drawing (VGD) system at the Irbitskii Glass Works in 1995 – 1998 corroborate the validity of the proposed approach to this problem and the significance of this factor for the processes of glass melting and molding.

[1] Irbitskii Glass Works, Russia.

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TABLE 1

Date of glass sampling	Content, %			FeO : Fe_2O_3 (redox factor), %	Content of $Fe_2O_{3(tot)}$, % (from analysis)	Glass radiation coefficient
	$SiO_2 + Al_2O_3$	$R_2O + RO$	FeO			
10.03.98	73.74	25.36	0.019	21	0.132	
16.03.98	73.78	25.13	0.020	24	0.130	0.86
23.03.98	73.77	25.20	0.020	23	0.130	(March)
30.03.98	73.94	25.13	0.020	24	0.130	
06.04.98	73.60	25.56	0.021	23	0.140	
13.04.98	74.01	25.04	0.030	24	0.183	0.86
20.04.98	73.53	25.42	0.033	23	0.210	(April)
27.04.98	73.43	25.40	0.030	22	0.205	
05.05.98	73.68	25.41	0.028	24	0.185	
12.05.98	73.67	25.59	0.027	25	0.180	0.84
18.05.98	73.65	25.49	0.025	24	0.160	(May)
25.05.98	73.94	25.51	0.026	24	0.160	